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ABSTRACT

This document is a collection of activities designed to use children's literature to introduce, reinforce or broaden mathematics skills and concepts. The mathematical topics that are addressed include: time; problem solving; logic; measurement; comparison; sets; one-to-one correspondence; fraction concepts; division; counting; averages; infinity; computation; equality; length; ratio; proportion; three-dimensional figures; estimation; symmetry; reflections; palindromes; shapes; money; place value; classification; graphing; subtraction; multiplication; basic facts; factoring; primes and composites; and odd and even numbers. For each of the 17 books for which activities were developed the discussion includes appropriate grade levels, mathematical topics, other topics, needed materials, overview or activity description and suggested follow-up activities. The annotated bibliography has 49 entries and includes suggested appropriate grade level for each entry. (PK)

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BEYOND NUMBERS

The Mathematics Literature Connection

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Introduction

By combining the seemingly disparate areas of mathematics and children's literature, teachers may be able to enhance and enliven the scope of the mathematics curriculum and take advantage of an opportunity to incorporate more children's literature into the already crowded school day. The activities and annotated bibliography on the following pages are designed to stimulate classroom teachers and other professional educators to think about the possibility of including children's literature in elementary and middle school mathematics programs.

Using children's literature to introduce, reinforce, or broaden mathematics skills and concepts may eliminate some of the historical constraints associated with elementary and middle school teaching of mathematics. Mathematics may be presented in the context of the world in general and as part of the everyday environment and therefore may become more relevant in the total curriculum. Problem solving, logic, and reasoning skills can cross traditional curricular barriers and be perceived as part of the general educational program of any classroom.

The activities in this publication are meant to be open-ended and general. They should be viewed as suggestions and are presented in outline form to allow for maximum flexibility and utility. The annotations in the bibliography highlight the mathematics potential of the literature.

The work presented here is an outgrowth of our interest in mathematics and children's literature. We believe that classroom teachers should provide children with rich and exciting experiences in both literature and mathematics. We also believe that there are many ways for teachers to link these areas, thereby providing interesting and rewarding opportunities for children to learn.

Resources are available to aid professionals in the selection and use of children's books in mathematics classrooms. Several of these are included in the reference section of this material. These resources usually include books that are indexed in media collections under mathematics-related categories. The children's literature we have included was gathered from many sources but we have found one of the best sources to be word of mouth, recommendations from teachers and children's librarians. It is not possible to find some of the literature that we have included here listed under mathematics-related topics in professional indexes or in standard reference materials used by teachers. They must be known to the users. We have enlisted and received the help of teachers and media professionals to help build our own collection.

We view this as a small start and hope that you find it a useful resource to enrich your program.

If you find this material useful, we request that you share it with your colleagues and take the opportunity to share your experience and success in this area by sending us comments, student work samples, and resources to add to our collection.

A special thanks to Trudy Rodean of the Denton (Texas) Independent School District, the Texas Woman's University graduate students, and Sharon Reynolds of the Howard County (Maryland) Public Library who shared ideas and helped us dig!

Roz Seidenstein
John Madison
1987

ACTIVITIES

Cleary, Beverly. Ramona the Pest. William Morrow & Co., 1968.

Chapter 7, "The Day Things Went Wrong" pp. 112-113.

Grade levels: 1-3

Mathematics Topics: Time, problem solving, logic

Other Topics: Humor, feelings

Materials: clock
word problems
geoboards
paper strips
Pattern Blocks
Cuisenaire Rods

Overview/Activity:

Ramona's mother reminds her to leave for school at quarter after eight. Ramona watches the clock diligently. She reasons that it will be time to leave when the big hand is on the 5. It will then be twenty-five after eight, and she knows that twenty-five cents is a quarter, so that will be quarter after eight.

Questions:

1. What is logic?
2. Did Ramona use logic to solve the problem? What was faulty about her logic?
3. Describe a situation where you or someone you know was tricked by faulty logic.

Follow-up Activities:

1. Set up materials at each table in the classroom or in a learning center. Use such materials as geoboards with designs on them, paper strips, Pattern Blocks, and Cuisenaire Rods. Have the students work together to find one quarter of each group of materials.
2. Have students find other objects or pictures for homework that can be used to illustrate one quarter. Send a note home to parents explaining the assignment.

Douglas, Barbara. The Chocolate Chip Cookie Contest. Lothrop, Lee & Shepard, 1979.

Grade Levels: 2-6

Mathematics Topics: Measurement, comparison, following directions

Other Topics: Vocabulary, abbreviations

Materials: ingredients for cookie recipe (from book)
timer
oven
measuring spoons for each group
measuring cups for each group
cookie sheet or pizza pan (minimum size, 14 1/2 inches)
copies of the recipe for each student or group

Overview/Activity:

Read the book to the class about a boy who enters a cookie-baking contest, and discuss any references to measurement found in the story. Divide students into groups. Distribute measuring implements and the recipe.

Questions:

1. How would you measure the flour (2 cups) if you used a one-fourth cup measure? One-half cup measure?

2. How would you measure the peanut butter (1/2 cup) if you used a one-fourth cup measure?

3. How would you measure the oatmeal (1 1/2 cups) if you used a one-fourth cup measure? A one-half cup measure?

4. How would you measure the baking soda (1 teaspoon) if you used a one-fourth teaspoon measure? A one-half teaspoon measure?

Provide each group with the ingredients and measuring utensils necessary for making the cookie. Read the recipe with the class, discussing each step and demonstrating if necessary. Discuss oven temperature and how to time the baking. Supervise the making and baking of the cookies.

Follow-up Activity:

Introduce students to the abbreviations for each kind of measurement used in cooking. Provide students with other recipes and discuss the abbreviations for the various measures.
(Idea: Barbara McCollough, Texas Woman's University)

Ginsburg, Mirra. Across the Stream. Greenwillow Books, 1982.

Grade Levels: K-3

Mathematics Topics: Logic, one-to-one correspondence, problem solving, sets

Other Topics: Art, creative dramatics

Materials: cutouts of a hen and three chicks
cutouts of a duck and three ducklings
3 red cubes (or squares, triangles,etc.)
1 larger red cube
3 blue cubes
1 larger blue cube

Overview/Activity:

After reading this book about how a family of ducks and a family of chickens solve the problem of how to get the chickens across the stream, have students state the problem and discuss the way in which the ducks helped the chickens solve the problem.

Questions:

1. How many ducklings (baby ducks) were there in the story? How many ducks were there altogether, counting the mother duck?
2. How many chicks (baby chickens) were there in the story? How many chickens were there altogether, counting the mother hen?
3. How many animals (ducks and chickens) are there altogether in the story?
4. How many ducklings are needed to take the chicks across the stream?
5. How many mother ducks are needed to take the mother hen across the stream?

Using the cutouts, ask groups of children to demonstrate one-to-one correspondence by lining up the ducks and chickens. Repeat the process with the cubes or other objects. Ask children to dramatize the story using the cutouts.

Follow-up Activity:

Using the story as an introduction, many different combinations of problems can be created. Example: If one chick and one duckling have crossed the stream, how many chicks are left on this side? How many ducklings? Using the other objects, ask children to represent other operations. Reinforce the concepts of one-to-one correspondence and sets.

(Idea: Cathy Little, Texas Woman's University)

Gomi, Taro. Sharing. Heian International, 1981.

Grade Levels: K-2

Mathematics Topics: Fraction concepts, part of a whole, part of a set, and division as sharing, including remainders

Other Topics: Sharing, making friends

Materials: jar filled with candy
apple
knife
pieces of colored paper
ribbon and scissors
toy
plastic links
interlocking cubes

Overview/Activity:

Read the story about two friends who share. Discuss the ways in which the friends shared various things. Reread the story, acting out each part with the appropriate objects. Talk about what remainders are.

Questions:

1. What does sharing mean?
2. What does sharing equally mean? How can you tell if you have shared something equally?
3. What do you do with the leftovers?

The friends had trouble sharing the ribbon equally. They solved their problem by making bows. Think of a different way to solve their problem so that you and a friend will have pieces of the same length.

Follow-up Activity:

Set up materials at each table. Using such materials as plastic links and interlocking cubes, have the students divide them into two, three, and four parts. Change the total number they have each time, using some examples with remainders.

Hoban, Tana. Count and See. Macmillan, 1972.

Grade Levels: K-2

Mathematics Topics: Counting, problem solving

Other Topics: Photography, nature

Materials: magazine pictures
camera and film
calculators with constant key

Overview/Activity:

Hoban's books, illustrated with photographs, are excellent examples of literature that can be used to connect the world of classroom mathematics to the uses of mathematics in the outside world.

Students could collect pictures that represent the number concepts. They could also work in groups to photograph things in their environment and produce their own books.

Follow-up Activity:

Using calculators with a constant key, teach students how to count with the calculator by pressing the 1 and then + = = =. Then ask students to try counting by twos and fives. Ask them to predict what the number will be each time before they press the equals sign.

Hoban, Tana. More Than One. Macmillan, 1979.

Grade Levels: K-3

Mathematics Topic: Problem solving

Other Topics: Language arts, vocabulary development

Materials: magazine pictures
cameras and film
Popsicle sticks
rubber bands or twist ties

Overview/Activity:

Present this concept book about groups of objects. Note the vocabulary and how the words relate to mathematics. The word bundle, for example, has a special meaning when applied to place value concepts.

Questions:

1. How is the word bundle used in mathematics?
2. Why is the meaning of each word important?

Follow-up Activities:

1. Work in groups. Have the students, over a period of days, collect a list of words that are important in mathematics. Have them define these words and give examples, using their own illustrations or pictures from magazines.
2. Take a walking field trip. Each group should have a camera. Using More than One as a model, take pictures of situations that illustrate mathematics vocabulary.
3. Prepare a bulletin board using examples of children's work resulting from activities 1 and 2.
4. Play "Make a Hundred." Use Popsicle sticks and one die per group. Each person rolls the die and takes the number of sticks indicated on the die. Whenever the player has 10, a bundle must be made using a rubber band or a twist tie. Play continues until each player makes a bundle of 100 out of the ten bundles of 10.

Juster, Norton. The Phantom Tollbooth. Random House, 1961.

Chapter 16, "A Very Dirty Bird"

Grade Levels: 4-8

Mathematics Topics: Problem solving, averages, infinity

Other Topics: Fantasy versus reality, science fiction

Materials: measuring tape
pencils
crayons
chart paper

Overview/Activity:

Milo is in Digitopolis, climbing the stairs to Infinity. He comes upon a child, or more precisely, 0.58 of a child. They have a rather unusual conversation about averages.

Questions:

1. What is infinity? Will you ever get there? Does it matter?
2. What are averages? What do you think about the child's logic in regard to averages?

Divide students into groups. Draw pictures of the child and of what infinity might be like. Write a story about a (not-so-typical) day in the life of 0.58 of a child.

Follow-up Activities:

1. Have students measure body parts such as arms, wrists, waists, necks,and so forth, with a tape measure. Have them record these data on a class record sheet. Find the average (prototype) "Ms. Fifth Grader" and "Mr. Fifth Grader." Draw life-sized versions of these "average" students.
2. Students might also collect data on teachers in the school or on their families to create the average teacher and the average family member.
3. The concept of mode may be introduced by interviewing students in the class to find out their favorite color, foods, books, lucky numbers, and so on.

(Idea: Barbara Sylvester, Texas Woman's University)

L'Engle, Madeleine. A Wrinkle in Time. Farrar, Straus & Giroux, 1962.

Chapter 3, "Mrs. Which" pp. 42-43

Grade Levels: 4-8

Mathematics Topics: Computation, problem solving

Other Topics: Discussion of mathematics issues, process vs. product

Materials: pencil and paper
overhead projector
examples of completed problems that demonstrate alternative methods of solution

Overview/Activity:

Calvin is trying to complete his mathematics homework. At Mrs. Murry's suggestion, he asks his friend Meg for help. Meg wants to know if his teacher cares about the procedure that is used or just the answer. She seems concerned that her teachers expect her to do the examples a certain way. Mrs. Murry comments that the difficulty is that Meg and Mr. Murry used to play with numbers and Meg knows "too many shortcuts."

It is suggested that this section be used to introduce the topic of product versus process in the mathematics class. Prepare examples for use on the overhead projector. Two or more methods of solution should be illustrated for each. It would be useful to use some computation examples as well as some nonroutine problems-those which are not solved by using simple number sentences. Students must employ strategies such as drawing a design, working backward, and so forth.

Sample Problem 1

John is going to wallpaper a room. He estimates that the two solid walls will each need 2 1/2 rolls of the wallpaper he has chosen. The wall with the door and the wall with the window will need 3/4 of a roll and 1 1/2 rolls. If John's estimates are correct, how many rolls of wallpaper should he buy?

(continued)

L'Engle, Madeleine. A Wrinkle in Time

Solution # 1

2 x 2 1/2 = 5

Then: 5
3/4
+ 1 1/2
---
6 5/4 = 7 1/4

John needs 7 1/4 rolls. Therefore, he will need to buy 8 rolls of wallpaper.

Solution # 2

Add: 2 1/2, 2 1/2, 3/4, 1 1/2
(Add the whole numbers first)
Think: 2, 4, 5
(Next - Add the halves)
Think: 5, 5 1/2, 6, 6 1/2
(Then - Add the 3/4)
Think: 6 1/2, 7 1/4

John will need to buy 8 rolls.

Sample Problem 2

Four students challenge each other in Ping-Pong. If each student plays each other student one time, how many games will be played?

Solution 1 (Strategy: Make a list)

Players are labeled A, B, C, and D.
Make a list of games played.

AB
AC
AD
BC
CD
BD

There will be 6 games.

(continued)

L'Engle, Madeline. A Wrinkle in Time

Solution 2 (Strategy: Draw a diagram)

Count the lines. Six lines equals 6 games played.

Solution 3 (Strategy: Write an equation)

4 x 3 = 12

12 divided by 2 = 6 (games played)

Questions:

1. Why did Meg get frustrated about her mathematics teacher's attitude about classwork?
2. Do you believe that it is important to accept more than one correct way of doing a problem? Why?
3. Why might a teacher insist that you do a problem a certain way?
4. Have you ever had a teacher who seemed to accept answers to mathematics problems only if you could explain how you did the work? Why do you think the teacher wanted to know if you could explain how you did the work?
5. Sometimes when your parents try to help you with your homework they realize that the process they use to solve a problem is different from the one you are learning about. Has this ever happened to you? What could you, your parents, and your teacher do about this?

Follow-up Activity:

Divide the class into groups. Take a walk to get the mail from the letter box or to buy something from the local store. Have the groups of students keep track of the things they see along the way and the specific route they take to get to the destination. Compare results from the different groups. Groups may see different things and take different paths (the process), but all arrive at the same destination (the product).

L'Engle, Madeleine. A Wrinkle in Time. Farrar, Straus & Giroux, 1962.

Chapter 6, "The Happy Medium"

Grade Levels: 4-8

Mathematics Topic: Equality

Other Topics: Art, language arts

Materials: pictures of objects that have the same underlying structure

Overview/Activity:

The Murry family is in Camazotz, where everything is identical. They realize that the people are not robots, but everything appears to be quite equal -- houses, movements of people. They discuss how they feel about that.

Show some examples of equality in pictures.

Questions:

1. How are these pictures equal? How are they unequal?
2. How do you think you and your family and friends would feel about being in Camazotz? What might you enjoy? What might make you feel uncomfortable?
3. Why is equality important in mathematics?

Follow-up Activities:

1. Work with a group of other students. Draw a picture of Camazotz. Write a paragraph describing your experiences there.

2. Divide the class into groups. Have the students collect sets of pictures that are the same. For example, find pictures of two people who look alike but have different patterns on their clothes but are essentially equal, or have students prepare pictures that represent equivalent fractions. Prepare a bulletin board that requires the students to match the people or the equivalent fractions.

Lionni, Leo. Inch by Inch. Astor-Honor, 1960.

Grade Levels: K-2

Mathematics Topics: Measurement: length

Other Topics: Insects, fables

Materials: strips of heavy paper (tagboard, 12 inches long with 1-inch marks)
markers
crayons
picture of an inchworm
12-inch ruler

Overview/Activity:

Read this modern fable of how an inchworm uses quick thinking to outwit an adversary. Emphasize the measurement tasks performed by the inchworm. Note the illustrations.

Questions:

1. How did the inchworm outsmart the bird?
2. Is the story real or make-believe?
3. Where does the inchworm get its name?

After explaining that an inch is a unit of measurement, the teacher will show the one-inch measure on a 12-inch ruler. Distribute the strips of paper with one-inch marks and ask the students to draw inchworms in the spaces between the one-inch marks. (Teacher may wish to demonstrate or provide an example.)

Students may then be asked to measure and report lengths of different objects in the room.

Follow-up Activity:

This story may provide the basis for a science lesson or series of lessons on inchworms. This book can introduce a science unit on the stages of development for certain types of insects and their life cycles.

(Idea: Jeanne Crozier, Texas Woman's University)

Macaulay, David. Pyramid. Houghton Mifflin Co., 1975.

Grade Levels: 4-8

Mathematics Topics: Problem solving, measurement, ratio, proportion, time, three-dimensional figures

Other Topics: Archeology, architecture, history

Materials: construction paper
crayons, markers, pencils
compasses, protractors
pipe cleaners, straws
clay

Overview/Activity:

This intricate and exquisitely illustrated information book about the construction of the Great Pyramid can be used in many ways. For this activity you may choose to read only portions of it. As a drawing activity, have students draw a three-dimensional representation of a pyramid. Some may wish to create a model using clay or pipe cleaners and straws.

Questions:

1. What are the main parts of the pyramid construction? (p.11)
2. What directional relationship was important in pyramid construction? (p.22) Why was it important?
3. Pyramid construction gives us some examples of the ways architects use mathematics. Work with a group of students and list some of them.
4. In your group, make a timeline that indicates the progress in the construction of the pyramid. (p. 52)
5. Research some other sources to find out more about pyramids. You might be interested in Machu Picchu.
6. Where would you build a pyramid in your town? Why?

Follow-up Activity:

Have students write "Who Am I?" stories about three-dimensional figures. For example: "I am a three-dimensional shape with eight edges, five vertices, four faces that are triangles, and one base that is a square. I am a_____."

Norton, Mary. The Borrowers. Harcourt, Brace & World, 1953 (Chapter 1).

Grade Levels: 2-6

Mathematics Topics: Measurement (relative size), problem solving

Other Topics: Cooperation, cultural awareness

Materials: pencil and paper
crayons

Overview/Activity:

Read the chapter that describes the symbiotic relationship between the humans and the Clock family (borrowers), the tiny people who live between the floors and in the walls of a house. Discuss the major characters and difference in size between the humans and the borrowers.

Questions:

1. How are items such as safety pins and matchboxes useful to the borrowers?
2. What other items could they use?
3. Draw pictures of them with some of the items that they use.

Divide students into groups. Write about how it might feel to be the size of a borrower.

Follow-up Activity:

Have groups of students draw a person or animal of a specific height (2 inches). Then have them draw a second person twice that height. Then draw a person four times that height. Compare the drawings.

Rockwell, Thomas. How to Eat Fried Worms. Franklin Watts, 1973.

Grade Levels: 4-8

Mathematics Topics: Equivalent fractions, renaming, estimation

Other Topics: Humor, predicting outcomes, dialogue in stories

Materials: Chinese noodles (several cans)
plastic sandwich bags
play money (one-dollar bills)
Gummy Worms candy (optional)

Overview/Activity:

After reading this book about a boy who reacts to a dare and agrees to "eat 15 worms prepared in 15 different ways in 15 days for $50," pass out sandwich bags containing Chinese noodles (fried worms). Each bag should contain a minimum of 15 "worms." Students will use the noodles to illustrate the fractional part of the bet completed on any day the teacher names.

Questions:

1. Could this story be true? Why or why not?
   What other ways can you think of to prepare the worms for eating?
3. What do you think would have happened if Billy's parents found out about the bet?

Follow-up Activities:

1. More advanced students or those with a background in equivalent fractions may be guided to an understanding of the equivalent fractions for 3/15, 5/15, 6/15, 9/15, 10/15, 12/15, and 15/15.

2. After students have mastered the concept of fractions with the numeral 15 as the denominator, those who are capable may be challenged to use play money to illustrate the fractional parts of the $50 bet completed on days 3, 6, 12, and 15.

3. After a final review of the concepts learned in these activities, students may be invited to dramatize the story using Gummy Worms candy (if available) for worms.

(Idea: Patricia Stafford, Texas Woman's University)

Silverstein, Shel. Light in the Attic. Harper & Row Publishers, 1981.

"Reflection," p. 29

Grade Levels: 3-6

Mathematics Topics: Symmetry, reflection, palindromes

Other Topics: Art, science, nature

Materials: mirrors
magazine pictures that illustrate reflections

Overview/Activity:

Read this poem about looking into a pool of water as an introduction to the concept of reflection/symmetry. Use magazine pictures that illustrate reflections. Have the students draw their own reflections when they look in the mirror.

Follow-up Activity:

Study palindromes both in language arts and mathematics. Locate or write sentences that are palindromes. (Example: Madam I'm Adam.) Have students decide which letters of their names and of the alphabet are symmetrical (Example: Capitals A, H, M, T, U, W). Find the names of classmates and family members that are palindromic Example: (DAD, MOM, BOB). Demonstrate how to create palindromic numbers from those that are not by using the "reverse and subtract" method shown below.

For example: 423 is not palindromic.
Reverse this to get 324.
Then subtract: 423 - 324 = 99.
99 is a palindrome.
Other numbers might require more than one step to get a palindrome.

For example: 742 is not palindromic.
Reverse 742 to get 247.
Then subtract: 742 - 247 = 495.
495 is not palindromic.
Reverse 495 to get 594 and subtract as before.
594 - 495 = 99

See Nichol, Margaret. "Addition through Palindromes," Arithmetic Teacher 26, December 1978, pp. 20-21

Silverstein, Shel. Light in the Attic. Harper & Row Publishers, 1981.

"Shapes," p. 77

Grade Levels: 2-6

Mathematics Topics: Shapes: attributes of squares, circles, and triangles

Other Topics: Art, personification in poetry

Materials: drawing paper
crayons, markers, etc.
Attribute Blocks

Overview/Activity:

Read the poem about different geometic shapes. Discuss the personification of the shapes. Have the students draw pictures of the shapes in the poem. They might also draw others that are not included in the poem.

Follow-up Activity:

Use "Attribute" or "Logical" blocks. Play a game where students make a train of shapes, changing only one attribute each time.

Silverstein, Shel. Where The Sidewalk Ends. Harper & Row, 1974.

"Smart," p. 35

Grade Levels: 2-6

Mathematics Topics: Money, place value, problem solving

Other Topics: Humor, trading, parent-child relationships

Materials: real money: dollar bills, quarters, dimes, nickels, and pennies
problems where money exchanges and making change will occur

Overview/Activity:

Read the poem "Smart" to the class. In this poem the main character makes a series of trades that indicate he does not understand the value of money. Discuss the "joke."

Questions:

1. What does swap mean?
2. Why did the boy swap the dollar bill for two quarters?
3. Was the boy's dad really proud of him?
4. How old do you think this boy is? Why do you think so?
5. If you knew students who had this difficulty, what information could you teach them so that they wouldn't make the same mistakes?

Follow-up Activities:

1. Provide some opportunities for the students to work in groups on some problems that involve money exchanges. Have children discuss the exchanges and why they are correct (or incorrect).
2. Have students bring to school examples of things that they or a family member collects (stamps, comic books, etc.). Talk about the kind of swapping that occurs or can occur as they do their collecting. (See Cook, Ann, and Herb Mack. Robot Goes Collecting. Dell, 1982.)

Spier, Peter. People. Doubleday & Co., 1979.

Grade Levels: K-6

Mathematics Topics: Classification, attributes, problem solving, graphing

Other Topics: Creative writing, vocabulary development, regions of the world

Materials:
family pictures
magazine pictures
camera and film
paper, pencil
tape recorder
People Pieces
attribute people

Overview/Activity:

Read this story about likenesses and differences in people to the students. Discuss the various attributes. Choose one attribute for the start of the lesson (such as hair). Use the pictures from the book and from magazines.

Divide the students in this class into work groups. Describe the hair of the students in your group. Have someone record your findings (written) or record them on the tape recorder.

Choose another attribute. Take pictures of people representing various examples of that attribute. Prepare a bulletin board to display the results in chart or graph form.

Follow-up Activity:

Use a set of "People Pieces" or construct a set of attribute people. You might use characteristics such as clothes, height, hair color, and so forth. Make a train of people, changing only one attribute from the first to the second person, the second to the third, and so on.

Viorst, Judith. Alexander Who Used to Be Rich Last Sunday. Atheneum Publishers, 1978.

Grade Levels: 3-6

Mathematics Topics: Money, place value, subtraction, problem solving

Other Topics: Prediction, emotions (feelings)

Materials: play money or real money for each child or working group:

1 one-dollar bill
7 dimes
4 nickels
10 pennies

Overview/Activity:

Read this book about a small boy who is given a dollar by his grandparents. Distribute a set of money to each student or group. Read the book again as students subtract coins for each transaction in the story.

Questions:

1. Did Alexander spend his money wisely?
2. If you were given one dollar, what would you do with it? If you spent it, what would you buy?
3. If Alexander's grandparents give him money again, what do you think he will do with it?

Follow-up Activity:

A worksheet representation of the transactions in this story may be prepared. Emphasis may be given to placement of the decimal point when subtracting money.

Example: $\$1.00 - .15$ $\$.85 - .15$ $\$.70 - .12$ or $\$1.00 - 15 =$ _____

$\$.85 - 15 =$ _____

(Idea: Marsha Andrews, Texas Woman's University)

Wahl, John, and Stacey Wahl. I Can Count the Petals of a Flower. National Council of Teachers of Mathematics, 1976.

Grade Levels: 3-6

Mathematics Topics: Multiplication, basic facts, factoring, primes and composites, even and odd numbers

Other Topics: Mathematics in nature, photography

Materials: pictures of flowers
flower identification books

Overview/Activity:

In the second section of this book, which contains color photographs of flowers, the pictures may be used to represent basic multiplication facts. For example, three flowers with two petals each equals six petals. Have groups of children list other attributes of flowers. Use flower identification books to find out (research) the characteristics that the authors use to identify and classify flowers. Talk about why they use these characteristics.

Follow-up Activity:

Bring to school real flowers from home or collect wild flowers from the school environs. If possible, take pictures of flowers and start a collection of slides similar to those in the book.

BIBLIOGRAPHY

Annotated Bibliography

The following grade level designations are useful as a general reference only. When used creatively, both the literary and mathematics content of the books in this bibliography may be appropriate for many different levels depending on the purpose.

Grade Level Designations:
K - Kindergarten
PRI - Grades 1-3
INT - Grades 4-5
MS - Grades 6-8

Andersen, H. C. Twelve by Mail Coach. G. P. Putnam's Sons, 1981.

PRI The numeral 12 is presented as a number, as 12 o'clock, and as the number of months in a year.

Anderson, Lonzo. Two Hundred Rabbits. Viking Press, 1968.

K PRI A counting book, in story form, with a surprise ending, told from the perspective of the 200th rabbit.

Anno, Mitsumasa. The King's Flower. G.P. Putnam's Sons, 1970.

PRI INT A highly imaginative presentation of comparative sizes.

Anno, Mitsumasa. Upside-Downers. John Weatherhill, 1971.

PRI INT Reverse images, numerical possibilities, and creative thinking using a deck of cards.

Brink, C. R. Caddie Woodlawn. Macmillan Co., 1970. "A Dollar's Worth"

INT This chapter, in a delightful historical novel for children, presents the concepts associated with money and the complexities of using dollars and cents.

Brown, Marcia. Dick Whittington and His Cat. Charles Scribner's Sons, 1950.

INT One of the problems presented in this rich historical work focuses on the concepts involved in bartering, trading, and establishing comparable worth of goods.

Carle, Eric. The Very Hungry Caterpillar. The World Publishing Co., 1969.

K PRI This very popular concept book effectively demonstrates the number/numeral relationship of numbers 1 through 5 as the caterpillar eats "through" various objects.

Carroll, Lewis. Through the Looking Glass. Penguin Books, 1985.

Chapter 9 "Queen Alice"

INT MS In this sequel to Alice's Adventures in Wonderland, readers encounter situations dealing with keying, division, and misused logic.

Cleary, Beverly. Henry Huggins. Morrow, 1950.

"Gallon of Guppies"

INT MS Estimation and quantity are featured in this chapter of Cleary's humorous classic for children.

Cleary, Beverly. Ramona the Pest. William Morrow and Co., 1968.

Chapter 7 "The Day Things Went Wrong"

PRI Among the many problems faced by a kindergartner is learning to tell time. This amusing chapter points out what can happen when logic is used inappropriately.

Cook, Ann, and Herb Mack. Robot Goes Collecting. Dell Publishing Co., 1982.

PRI In this entertaining story about collecting, Robot collects mysterious objects while a young girl and her friend start a collection of balls. Good discussion starter.

d'Aulaire, Ingri and Parin. Don't Count Your Chicks. Doubleday and Co., 1973.

K PRI This traditional counting book also presents addition and multiplication in an entertaining manner.

Douglas, Barbara. The Chocolate Chip Cookie Contest. Lothrop, Lee & Shepard, 1985.
PRI A young boy enters and wins a cookie contest after
INT devising a special recipe using ingredients suggested by various relatives.

DuBois,William. 21 Balloons. Penguin Books, 1986. "The Gourmet Government"
INT This chapter introduces an intriguing system for
MS labeling family members and a method for dividing family duties on a monthly basis.

Eager, Edward. Half-Magic. Harcourt Brace Jovanovich, 1985.
INT This charming fantasy involves readers in the use of
MS logic, multiplication, and fractions. Wishes are granted by halves to the holder of a special talisman.

Gag, Wanda. Millions of Cats. G.P. Putnam's Sons, 1977.
K This classic picture book in folk tale form allows
PRI children to experience ever-increasing numbers (of cats) and helps readers to conceptualize large numbers.

Ginsburg, Mirra. Across the Stream. Greenwillow Books, 1982.
K Getting a family of chicks across a stream is a problem
PRI that must be solved by a family of ducklings. Written for young children, this delightful picture book presents the classical logic problem in an understandable manner.

Gomi, Taro. Sharing. Heian International, 1981.
K This clever easy-to-read book about sharing, introduces
PRI young children to fractions, sets, and simple division.

Henry, Marguerite. White Stallions of Lipizza. Macmillan Publishing Co., 1979.
INT In this richly illustrated book, Henry presents the
MS ritual movements of the Lipizzan horses as they relate to the chess patterns of the knight.

Hoban, Tana. Count and See. Macmillan Publishing Co., 1972.

K PRI The numerals from 1 to 15 and 20, 30, 40, 50, and 100 are presented using photographs.

Hoban, Tana. More Than One. Macmillan Publishing Co., 1979.

K PRI Using photographs, this book presents vocabulary related to groups of things (bundle, herd, bunch).

Henry, O. The Ransom of Red Chief. Creative Education, 1983.

INT MS In this humorous farcical tale, readers become involved in creative problem solving and comical logic and need a good understanding of subtraction as the "ransom" becomes complicated.

Hogrogian, Nonny. One Fine Day. Macmillan Publishing Co., 1971.

PRI A delicately illustrated picture book that presents sequencing and logic in a clear and understandable manner.

Holling, Holling C. Tree in the Trail. Macmillan Publishing Co.,(nd).

INT MS Exceptionally clear presentation of a time-line beginning with nomadic Native Americans and extending to pioneers on the Santa Fe Trail. Presents the concept of calculating the age of a tree by counting concentric circles.

Juster, Norton. The Phantom Tollbooth. Random House, Inc., 1961.
Chapter 16 "A Very Dirty Bird"

INT MS In this humorous fantasy of Milo's adventures in Digitopolis, infinity and averages are presented in an amusing and understandable manner.

Kahl, Virginia. How Many Dragons Are Behind The Door? Charles Scribner's Sons, 1977.

K PRI This standard counting book for young children makes use of clever illustrations and story to enliven the number-numeral connection.

L'Engle, Madeleine. A Wrinkle in Time. Farrar, Straus & Giroux, Inc., 1962.
Chapter 3 "Mrs. Which"
Chapter 6 "The Happy Medium"

INT MS Sophisticated concepts of time, space, and dimension are presented in this exciting, clearly written fantasy/adventure for older children.

Langstaff, John. Over in the Meadow. Harcourt Brace Jovanovich, 1973.

K PRI A creative counting book that presents numbers in verse form with clever repetitious rhyming.

Latham, Jean. Carry on, Mr. Bowditch. Houghton Mifflin Co., 1955.

INT MS This award-winning fictionalized biography of a mathematical genius is an excellent introduction to nautical and celestial navigation.

Leodhas, Sorche Nic. Always Room for One More. Holt, Rinehart & Winston, 1965.

PRI Sequence, counting, and addition are part of this rollicking folk tale illustrated by Nonny Hogrogian.

Lionni, Leo. Inch by Inch. Astor-Honor, 1960.

K PRI Measurement by inches is only one of the topics in this delightful fable about a curious inchworm. Readers and listeners will enjoy Lionni's excellent illustrations.

Macaulay, David. Pyramid. Houghton Mifflin Co., 1975.

INT MS This intricately illustrated book introduces readers to many examples of mathematics used by architects and builders.

McClosky, Robert. Homer Price. Viking Books, Inc., 1943.
"The Doughnuts"

INT The concepts of estimation and quantity are important in this comical misadventure in the life of Homer Price.

Norton, Mary. The Borrowers. Harcourt, Brace & Co.,1953.
PRI The Clocks, a family of tiny people, live by borrowing
INT things from humans. Children can be introduced to comparative and relative sizes in this first book in a series of fantasy/adventures.

O'Brien, Robert C. Mrs. Frisby and the Rats of Nimh. Atheneum Publishers, 1971.
PRI Logic, problem-solving and scientific/mathematical
INT reasoning are part of the rich fantasy of this award-winning book about the adventures of a mouse and a group of escaped "super rats" who are attempting to build a new civilization.

Raskin, Ellen. The Mysterious Disappearance of Leon (I Mean Noel). E.P. Dutton, 1971.
INT A humorous mystery based on a word puzzle involving
MS names and a series of clues, this clever novel requires readers to use logic, following directions, estimation and probability.

Raskin, Ellen. The Westing Game. E.P. Dutton, 1978.
INT Eight couples must use logic and deductive reasoning to
MS solve the mystery and claim the multimillion-dollar estate of Mr. Westing in this book for older children.

Rockwell, Thomas. How to Eat Fried Worms. Franklin Watts, Inc.,1973.
INT In this fast-paced, funny book, Billy attempts to win
MS a $50 bet by eating fifteen worms in fifteen days. Each worm is prepared differently -- fried, broiled, ketchup covered, and so forth.

Quigley, Lillian F. The Blind Men and the Elephant. Charles Scribner's Sons, 1959.
PRI This classic tale can be used to introduce logic and
INT problem solving and the results of inappropriate application.

Seuss, Dr. (Theodor Geisel). The 500 Hats of Bartholomew Cubbins. Vanguard Press, Inc., 1938.
K A magical hat that reproduces again and again provides
PRI an opportunity for the ultimate counting book.

Silverstein, Shel. A Light in the Attic. Harper & Row Publishers, Inc., 1981.

"Reflection"

PRI INT The poem "Reflection" in this collection of verse can be used to introduce the concept of symmetry. Several other poems in this book, including "Shapes" (p.21), contain mathematics-related content or concepts.

Silverstein, Shel. Where the Sidewalk Ends. Harper & Row Publishers, Inc., 1974.

"Smart"

PRI INT In this collection of humorous and sometimes serious verse, the poem "Smart" deals with the value of coins, money, and making change.

Spier, Peter. Noah's Ark. Doubleday & Co., Inc., 1977.

K PRI This detailed picture book can be used for introducing concepts of sequencing, counting by twos (doubling), and classifying.

Spier, Peter. People. Doubleday & Co., Inc., 1979.

PRI INT This beautifully illustrated book introduces children to the concept of classification.

Swift, Jonathan. Gulliver's Travels. Schocken Books Inc., 1984.

"Voyage to Lilliput"

INT MS This classic book teaches older children and adults about compass headings, time span, and comparison in the land of Lilliput.

Thurber, James. Many Moons. Harcourt Brace Jovanovich, 1973.

INT MS Logic and reasoning are important elements in this famous tale of cleverness and deceit. Features the Royal Mathematician.

Van Loon, Hendrick W. Story of Mankind. Liveright, 1984.

INT MS Winner of the first Newbery Medal (1922), this book traces the development of the human race from prehistoric times to the twentieth century. Presents the concept of eternity and a way to conceptualize the ages past.

Viorst, Judith. Alexander Who Used to Be Rich Last Sunday. Atheneum Publishers, 1978.

PRI Alexander, the youngest of three brothers, has no money until he receives one dollar from his grandparents. In nine transactions he is left with nothing.

Wahl, John, and Stacey Wahl. I Can Count the Petals of A Flower. National Council of Teachers of Mathematics, 1976.

PRI The beautiful color photographs of flowers can be used
INT for counting, factoring, multiplying, and introducing
MS odd and even numbers.

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